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The Role of Operations & Maintenance (O&M)

The best efforts to reduce negative environmental impacts in the built environment are doomed to failure unless well-crafted operations and maintenance (O&M) procedures are implemented. Furthermore, even the best O&M procedures are of no use unless they are understood and followed by building O&M personnel. Facility managers play the key role in ensuring that this happens. An “integrated team” approach can be a big help. In this process, O&M personnel are active participants in the design of a facility and the development of O&M procedures. This “integrated team” promotes useful procedures that are efficient and—most important—faithfully executed. Addressing O&M considerations at the start of a project can contribute greatly to improved working environments, higher productivity, and reduced energy and resource costs. The following sections of this guide provide a variety of O&M information on the important systems typically found in Federal facilities. Other O&M-related information also can be found in various places in the earlier sections of this guide.

Opportunities

There are tremendous opportunities in most existing buildings and facilities to improve O&M procedures and make them more environmentally responsible. With new buildings, there are opportunities during design and construction to facilitate easy, low-environmental-impact O&M. With all buildings there are opportunities to derive multiple benefits. Energy savings and improved indoor air quality can be achieved by tuning up older oil-fired boilers, for example. Improved indoor air quality and less hazardous effluent from a building can be achieved by switching to more benign cleaning chemicals. If implemented effectively, the multiple benefits of O&M practices should include reduced operating costs.

Technical Information

To create an effective O&M program, the following general procedures should be followed:

- Ensure that up-to-date operational procedures and manuals are available.
- Obtain up-to-date documentation on all building systems, including system drawings.
- Implement preventive maintenance programs complete with maintenance schedules and records of all maintenance performed for all building equipment and systems.
- Create a well-trained maintenance staff and offer professional development and training opportunities for each staff member.
- Implement a monitoring program that tracks and documents building systems performance to identify and diagnose potential problems and track the effectiveness of the O&M program. Include cost and performance tracking in this analysis.

Specific elements of an effective O&M program are addressed as follows:

HVAC systems and equipment: Energy consumption and conservation are tied heavily to O&M procedures. HVAC equipment must be well maintained for the complex array of chillers, boilers, air handlers, controls, and other hardware to function at peak performance. Easy access to HVAC systems for ongoing maintenance and repair is critical (be sure that this is considered during design). A well-thought-out, well-executed O&M program can provide huge savings in equipment and energy costs.



By installing a state-of-the-art O&M monitoring system in early 1993, the Marine Corps Air/Ground Combat Center at Twenty-Nine Palms, California was able to increase its hot water plant capacity by 30% and eliminate the need for a \$1.5 million boiler installation. This artificial-intelligence-based system saved \$138,000 in natural gas costs during its first year of operation, and its advanced diagnostic system reduces plant maintenance costs by up to 30%.



Source: Donald Hadley, Pacific Northwest National Laboratory

Monitoring building performance is an important part of operations and maintenance. The technician in this photograph is installing an energy performance sensor in a data logger at U.S. Navy Headquarters Building 33.

IAQ systems and equipment: Air ventilation and distribution systems should be well maintained and frequently checked for optimal performance. Coordination between air distribution systems and furniture layouts is especially important. In addition, regular inspection for biological and chemical contaminants is crucial. Poor IAQ lowers productivity, can cause illness, and has resulted in numerous lawsuits.

Cleaning equipment and products: Using biodegradable and least-toxic cleaning products and equipment can reduce both O&M costs and pollution to air and wastewater streams while improving both indoor air quality and worker productivity. The need for chemical cleaning products can also be reduced through environmentally conscious design and material choices. New requirements for cleaning contracts must be clearly specified. EPA has a Web site devoted to environmentally preferable cleaning products.

Materials: This aspect of O&M procedures received scant attention until major concerns about the handling and disposal of hazardous materials came to light. Now, facilities must maintain an attentive and proactive stance with regard to the environmental impacts of their material choices. Every day new products, systems, and equipment become available that have fewer adverse environmental impacts. All these choices should be carefully scrutinized in terms of O&M.

Water fixtures and systems: Routine inspections and maintenance programs for water fixtures and systems are crucial. Population growth and development have reduced the availability of high-quality, potable water in many regions of the country. Along with increased water prices, reduced supply often leads to usage restrictions. An O&M program will reduce operating costs when it verifies that fixtures and systems are functioning effectively and ensures that leaks or components are quickly repaired.

Waste systems: Recycling and waste-reduction programs and their supporting hardware need frequent attention and maintenance in order to function at peak performance.

Landscape maintenance: Use of native plantings can reduce landscape O&M requirements and costs significantly. Although natural vegetation may take several years to become established, once it is established there is usually less need for water. Integrated pest management can also reduce overall O&M costs by reducing the need for hazardous chemicals and pesticides.

References

Meador, Richard, "Maintaining the Solution to Operations and Maintenance Efficiency Improvement," *Proceedings of the World Energy Engineering Congress, Atlanta*, Association of Energy Engineers, 1995.

U.S. EPA Environmentally Preferable Cleaning Products; www.epa.gov/opptintr/epp/cleaners/select.

Contacts

Information on, and Web links to, commissioning and O&M print resources and training opportunities are available from Portland Energy Conservation, Inc., 921 SW Washington Street, Suite 312, Portland OR 97205; (503) 248-4636, (503) 295-0820 (fax); www.peci.org.

FEMP offers an Operations & Maintenance Management course. Contact the Help Desk at (800) DOE-EREC (363-3732) or check for training dates on the Web: www.eren.doe.gov/femp/resources/training/fy2001_om.html.